May 17, 1949. D. D. PAXTON 2,470,368

VALVE MECHANISM

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FIG. 1.

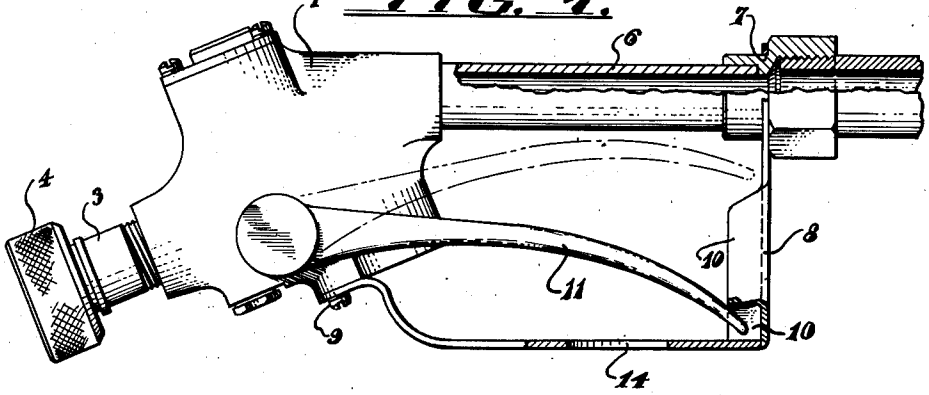


FIG. 2.

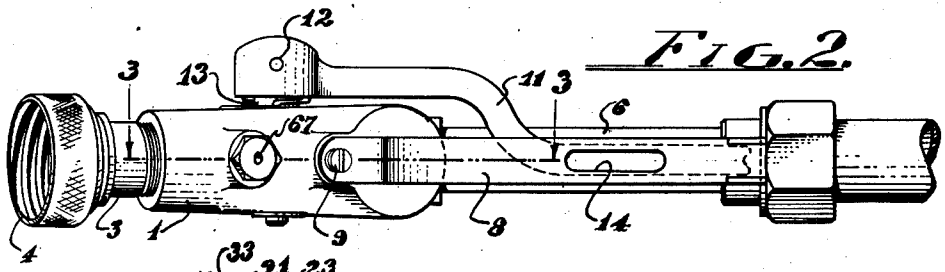
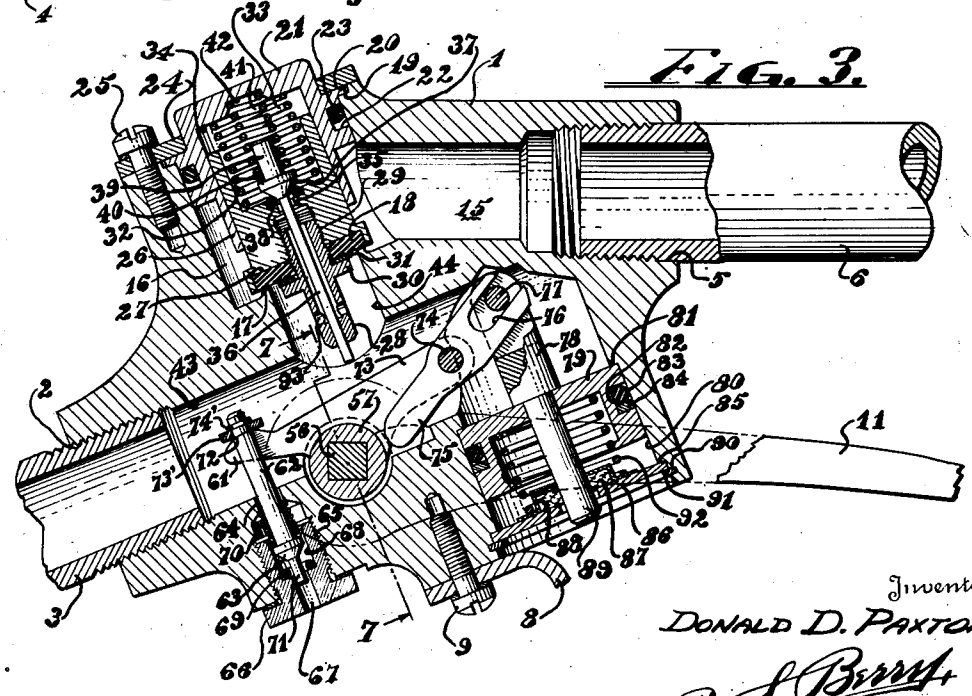


FIG. 3.



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VALVE MECHANISM

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FIG 4.

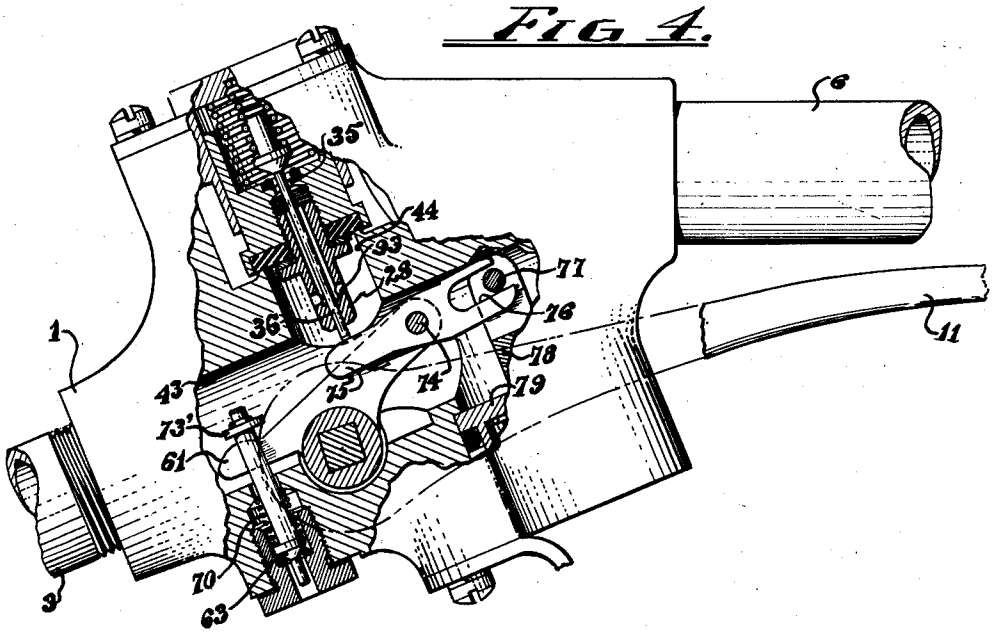
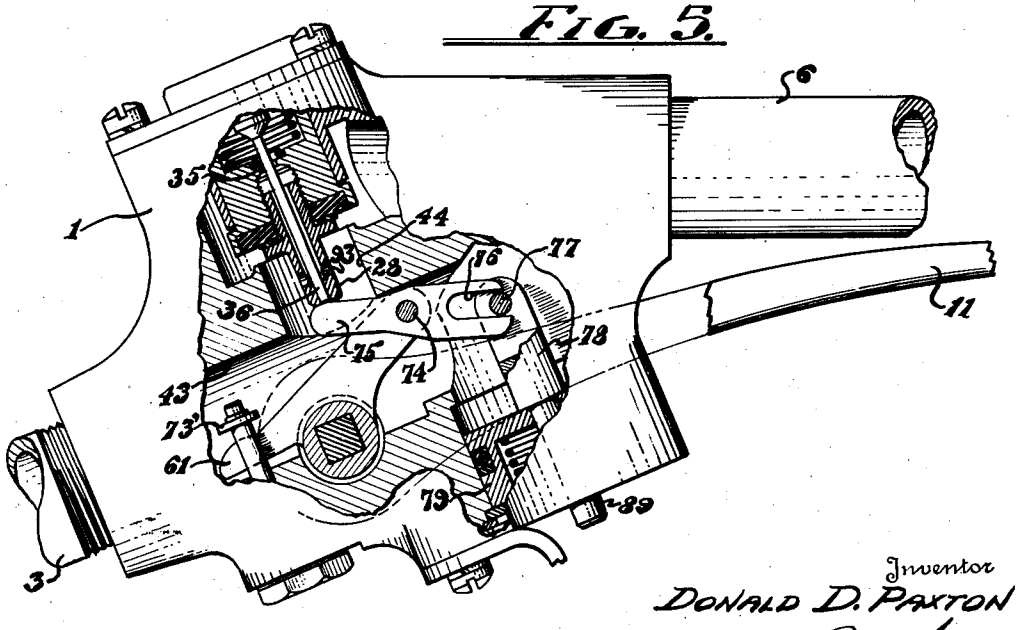


FIG. 5.



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VALVE MECHANISM

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FIG. 6.

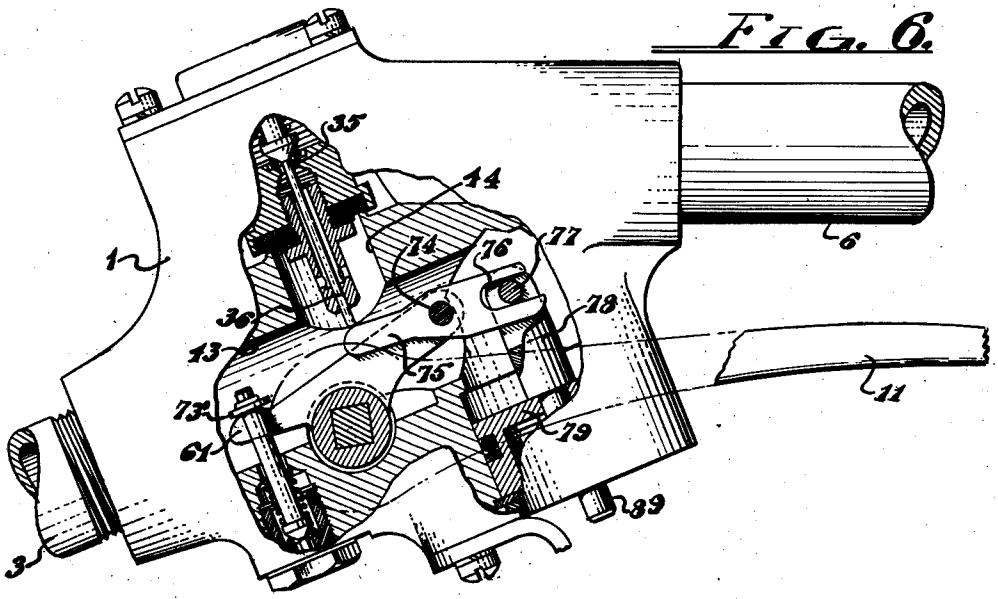


FIG. 8.

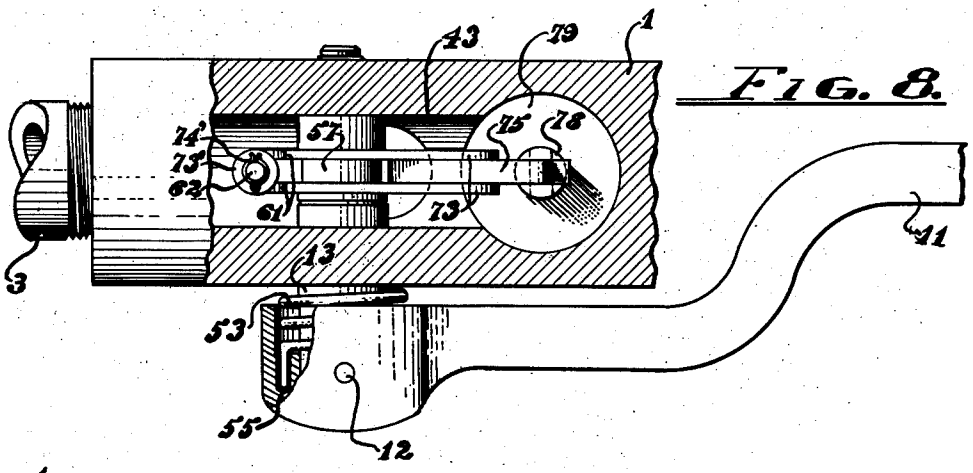
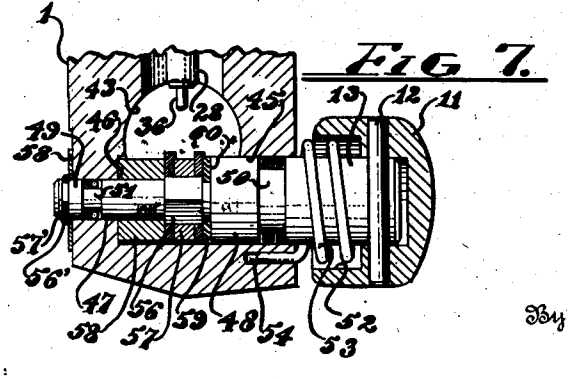


FIG 7.



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UNITED STATES PATENT OFFICE

2,470,368

VALVE MECHANISM

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Application June 15, 1946, Serial No. 677,007

6 Claims. (Cl. 137—144)

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This invention relates to dispensing nozzles for use in connection with the handling of liquefied gases and while the invention may be used as a valve for controlling the flow of liquefied gases generally, the illustrated embodiment exhibits the application of the invention to a dispensing nozzle for delivering liquefied petroleum gases such as butane, propane and mixture thereof from a dispenser to the fuel tank of a motor vehicle and the like. Heretofore with the exception of the nozzle valve apparatus shown, described and claimed in the application of Raymond J. Kirkby, Serial No. 635,544, filed December 17, 1945, which issued as Patent Number 2,441,706 on May 18, 1948, such dispensing nozzles have been large cumbersome devices, oftentimes homemade, and so constructed that a great deal of care had to be exercised in their use to prevent excessive losses of fluid. In many cases the entire contents of the dispensing hose is allowed to evaporate at the end of a dispensing operation with consequent waste of fuel and attendant danger of fire and explosion. In the device of Kirkby application referred to above, many of these disadvantages are eliminated but it is still necessary to separately manipulate two separate valves in the proper sequence to effect a proper dispensing operation.

With the foregoing considerations in mind, it is an object of the present invention to provide a valve operating means for controlling the flow of liquefied petroleum gases and the like in which only a single, manually controlled element is required to perform in proper sequence the various operations incident to the control of fluid flow in supplying a quantity of liquefied gas to a container.

Another object of the invention is to provide a valve operating means which is rendered ineffective to permit full fluid flow when the outlet of the valve is not connected to a tank or other inlet.

Still another object of the invention is to provide a valve means of the above character in which the pressure of the fluid is the operating means for opening the valve for fluid flow.

A still further object of the invention is to provide a valve means for a nozzle used for dispensing liquefied petroleum gases and the like which, upon release, will automatically bleed off the pressure between the main valve and the receiving tank to permit ready disconnection of the nozzle from the receiving tank.

With the foregoing objects in view, together with such other objects and advantages as may subsequently appear, the invention resides in the parts and in the combination, construction and arrangement of parts hereinafter described and claimed, and illustrated by way of example in the accompanying drawing, in which—

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Fig. 1 is a side elevation of a representative form of the invention, portions being broken away to show interior construction,

Fig. 2 is a bottom plan view of Fig. 1,

Fig. 3 is an enlarged fragmentary sectional view taken substantially on the line 3—3 of Fig. 2 and showing the various valves in the position occupied before a dispensing operation is started,

Fig. 4 is a view similar to Fig. 3 but showing the first stage of a dispensing operation,

Fig. 5 is a view similar to Fig. 3 but showing the relation of the various valves during the actual dispensing operation,

Fig. 6 is a view similar to Fig. 3 but showing the relation of the parts at the finish of a dispensing operation and before disconnection of the nozzle from the receiving tank,

Fig. 7 is an enlarged transverse fragmentary elevation taken on the line 7—7 of Fig. 3, and

Fig. 8 is a fragmentary top plan view of the valve operating mechanism.

The illustrated embodiment of the invention comprises a frame structure including a valve body 1 having an outlet port 2 into which is screwed one end of a nipple 3, the other end of which is provided with a suitable coupling 4 adapted for connection with the inlet of a receiving tank or the like. The body 1 is further provided with an internally threaded inlet port 5 into which one end of a tubular member 6 is screwed. The member 6 at its other end is enlarged and internally threaded to receive the end of a hose or the like leading to a dispensing apparatus. The enlarged end of the member 6 extends through an opening 7 in a guard member 8 which member extends first radially from the member 6 and thence parallel to said member to a point of attachment with the body member 1 by means of the screw 9. The radially extending portion of the guard member 8 is provided with spaced flange portions 10, 10 which provide guidance for the free end of an operating lever 11 the other end of which is fixed by a cross pin 12 to a rock shaft 13 journalled in and extending transversely of the body member 1. The parallel portion of the guard member 8 is further provided with an opening 14 through which a forked locking lug of conventional form may extend for subsequent application of a lock in the manner well understood in the art and whereby unauthorized use of the device may be prevented.

The valve body is provided with an inlet passage 15 extending betwen the inlet port 5 and a valve chamber 16 formed by a bore extending from the upper surface of the valve body and terminating in a valve seat ridge 17 adapted to be engaged by a valve disc 18. The outer end of the valve chamber bore 16 is provided with a shallow counterbore 19 adapted to engage the flange 20 of an inverted cup-shaped closure mem-

ber 21, the wall of which closely fits the walls of the bore 16 and is provided with a peripheral groove 22 in which is disposed a pressure-responsive resilient sealing ring 23. A ring member 24 engaging the outer face of the flange 20 and secured to the valve body member 1 by a series of screws 25 serves to hold the closure member in place and to provide a simple means of assembly. The interior of the closure member is bored to afford guidance for a main valve member 26 loosely mounted therein, which member at its lower end is provided with a shallow circular recess 27 in which the valve disc 18 is secured by the pilot valve guide member 28, one end of which is threaded into the main valve member 26 at 29 and which is provided with a radially extending flange 30 engaging a washer 31 which in turn engages the exposed face of the valve disc 18. The opposite end of the main valve member is counterbored as at 32 to form a seat for one end of a compression spring 33 whereof the other end is seated against the inner end face 34 of the closure member 21 and the spring is thus operative to tend to hold the main valve seated.

Disposed axially of the main valve member 26 and affording communication between the counterbore 32 and the threaded bore 29 is a pilot valve passage 35. Extending through this passage and thence through the pilot valve guide member 28 and extending therebeyond is a pilot valve guide stem 36 which within the counterbore 32 is provided with a conical valve seat face 37 adapted to engage the upper face a resilient sealing ring 38 surrounding the valve stem 36 and seated on the bottom of the counterbore 32. Above the valve seat 37 the pilot valve is provided with a reduced diameter portion 39 to provide a shoulder 40 on which one end of a compression spring 41 is seated. The other end of the spring 41 is seated in a shallow counterbore 42 in the end face of the closure member 26. The spring tends to maintain the pilot valve seated against the sealing ring 38 to prevent the escape of fluid through the passage 35.

The outlet port 2 communicates with a discharge passage 43 formed in the valve body by a bore extending in a direction at right angles to the axis of the valve chamber 16 and spaced therefrom. A passage 44 extending from the valve seat 17 provides communication between the valve chamber and the discharge passage. The free ends of the pilot valve guide 28 and the pilot valve stem extend through the passage 44 and into the discharge passage 43 for purposes hereinafter to be described in detail.

Extending through one side wall of the valve body 1 and extending across the lower portion of the discharge passage 43 intermediate the length thereof is a bore 45 having a squared end to provide a bearing wall or shoulder 46. Disposed in the same axial line as the bore 45 and extending from the wall 46 through the other sidewall of the body member 1 is a bore 47 of smaller diameter. The bores 45 and 47 serve as bearings for the bearing portions 48 and 49 respectively of the rock shaft 13, which bearing portions are provided respectively with peripheral grooves 50 and 51 in which suitable pressure responsive packings such as a resilient sealing ring and a compressible gasket member located on the side thereof remote from the point of application of pressure. The face of the shaft-engaging end of the operating lever 11 adjacent the valve body is provided with a counterbore 52 which serves as clearance and housing for a combined torsion and compression spring 53 surrounding the exposed end of the rock shaft 13 and having one end anchored in a bore 54 in the valve body member 1 and its other end anchored in a bore 55 in the operating lever 11. The spring is so proportioned and tensioned as to simultaneously tend to urge the shaft 13 and lever 11 in a clockwise direction as viewed in Fig. 3 and endwise to the right as viewed in Fig. 8. Endwise movement of the shaft is resisted by a snap ring 56' seated in a groove 57' formed in the exposed end of the small diameter portion of the shaft 13 and bearing against a thrust washer 58 surrounding the shaft and seated on the side wall of the valve body 1.

Intermediate its ends, the shaft 13 is provided with a rectangular portion 56 on which is mounted a lever arm member 57 held in place thereon by the spacer collars 58 and 59 engaging the opposite side faces of the lever arm member and the bearing wall 46 and the shoulder 60 formed by the juncture of the rectangular portion 56 with the bearing portion 48 of the shaft respectively. The lever arm member 57 is disposed longitudinally of the discharge passage 43 and is provided with a spaced pair of arms 61, 61 extending toward the outlet port 2 and adapted to straddle the stem 62 of a valve 63 extending through a bleed or pressure reducing port 64 formed in the valve body and affording communication between the discharge passage 43 and the exterior of the valve. The bleed port 64 terminates in an interiorly threaded counterbore 65 into which a bushing 66 is screwed, said bushing having a port opening 67 and a counterbore 68 combining with the port opening 67 to form a seat for a resilient sealing ring 69 adapted to be engaged by the valve 63 under the pressure of the compression spring 70 surrounding the valve stem 62 and extending between the end of the counterbore 65 and the valve 63. To maintain the seal ring in position, the valve is preferably provided with a pilot member 71 extending into the port opening 67 in all positions of the valve. At its other end, the valve stem 62 is slightly reduced in diameter to form a shoulder 72 for a washer 73' which washer extends across the faces of the arms 61, 61 and is held in place by a spring clip 74' engaging a suitable groove in the end of the valve stem.

The lever arm member 57 is further provided with a pair of spaced parallel arms 73, 73 extending away from the discharge port and carrying at their free ends a pivot pin 74 on which a lever arm 75 disposed between the arms 73, 73 is pivoted intermediate its ends. One end of the lever arm 75 extends beyond the ends of the arms 73, 73 and is provided with a slot 76 adapted to slidingly and pivotally engage a fulcrum pin 77 extending between the forked ends of a member 78 fixed to a piston 79 mounted for reciprocation in a cylinder bore 80 formed in the valve body 1 and communicating with the discharge passage 43 through a slight restriction of the cylinder bore 80, said restriction forming a shoulder 81 adapted to be engaged by and to limit the travel of the piston toward the discharge passage. Preferably, the piston is provided with a peripheral groove 82 in which is disposed a suitable pressure responsive packing such as a resilient sealing ring 83 and a backing ring or gasket 84. The cylinder bore 80 at its outer end is provided with a shallow counterbore to provide a shoulder 85 for a sealing member assembly comprising a base washer 86 having mounted thereon a felt washer 87 held in place by a keeper 88. The base washer, felt washer and keeper are provided with aligned bores

through which extends a stem 89 preferably formed as an extension of the member 78. The wall of the cylinder counterbore is provided with a peripheral groove 90 in which a snap ring 91 is located to hold the sealing member assembly in place. The base washer 86 and keeper 88 serve respectively as abutment and locating means for one end of a compression spring 92 the other end of which engages the head of the piston 79 and which spring is operative to urge the piston toward the discharge passage 43.

To start a dispensing operation, the nozzle is first coupled to the receptacle to be supplied such as the fuel tank of a motor vehicle. The lever 11 is then moved to rock the shaft 13 in a counter-clockwise direction. During the first portion of this movement the arms 61, 61 which normally hold the valve 63 unseated, move to permit the spring 70 to seat the valve. Upon continued movement of the lever 11 the arms 61, 61 move away from the washer 73'. At the same time the movement of the shaft 13 is causing the lever arm 75 to be moved in a clockwise direction about the fulcrum pin 77, the slot 76 permitting the necessary sliding action required to accommodate the arcuate path described by the pivot pin 74. This movement brings the free end of the lever arm 75 into contact with the end of the pilot valve stem after the valve 63 has been closed, and will cause the pilot valve to be opened, whereupon fluid under pressure will pass along the exterior of the loosely fitting main valve member thence through the pilot valve passage 35 into the clearance space in the pilot valve guide member 28 around the pilot valve stem and thence through the lateral ports 93, 93 in the pilot valve guide member into the passages 43 and 44. As pressure is built up in these passages the piston 79 will be moved outwardly in the cylinder 80 against the pressure exerted by the spring 92. Since the member 78 is rigidly fixed to the piston 79 this movement of the piston will cause the lever arm 75 to be given a further clockwise movement about the pivot pin 74 with resultant engagement of the free end of the lever arm with the end of the pilot valve guide member 28 and by such engagement to unseat the main valve permitting the free flow of fluid to the receptacle being filled.

When a dispensing operation is completed, the operator releases the lever 11 permitting the torsion spring 53 to return the lever and shaft 13 to the starting position. Since the pressure on both sides of the main valve is balanced, the spring 33 will cause the main valve to follow the free end of the lever arm 75 until it is seated, after which the pilot valve stem will follow the lever arm 75 under the urge of spring 41 until the pilot valve is seated. During this time, the piston 79 is still depressed against the pressure of the spring 92 and the arms 61, 61 are moving towards the washer 73 and after the main and pilot valves are closed the arms 61, 61 will unseat the bleed valve 63 against the pressure of the spring 70 and bleed off or relieve the trapped fluid extending between the main valve and the check valve which is located in the inlet of the receiving tank, thus facilitating the uncoupling of the nozzle from the receiving tank. As the pressure in the discharge passage is thus relieved, the spring 92 will move the piston 79 back to its initial position with resultant movement of the free end of the lever arm 75 away from the ends of the valves operated thereby. These lever arms are so proportioned that in the event of any attempt to operate

the lever 11 when the nozzle is not coupled to a closed receptacle, the most that can occur is unseating of the pilot valve. In this connection it is particularly to be noted that when open, each of the three valves is subject to the same fluid pressure on all sides and that when closed, the pressure will operate to hold them closed. Thus relatively light springs may be employed to close them. The relation of the parts under these conditions is substantially the same as shown in Fig. 4.

Thus it is that there has been provided a valve for controlling the flow of liquefied gases in which the manipulation of a single operating means controls the flow of such gases by a proper sequence of the various steps necessary to such control and which valve is therefore capable of use by any person, since an improper use is rendered impossible. While the illustrated embodiment shows a form of the invention particularly adapted to dispensing liquefied petroleum gases for motor fuels it will be apparent to those skilled in the art that similar valves may be employed for other liquefied gases such as refrigerants of various types. While reference has been made throughout the foregoing specification to liquefied gases, it will be appreciated by those skilled in the art that the invention may be equally useful in handling other fluids or gases under pressure with equally advantageous result.

While I have shown and described a specific embodiment of my invention, I do not limit myself to the exact details of construction set forth, and the invention embraces such changes, modifications and equivalents of the parts and their formation and arrangement as come within the purview of the appended claims.

I claim:

1. In a valve for controlling the flow of liquefied gases, a valve body having an inlet port adapted to be connected with a source of supply, an outlet port provided with a device affording a means of connection with a receptacle to be supplied, and manually operable valve means in said valve body comprising a pressure relieving port, a normally open valve operable to close said port, a normally closed pilot valve between said inlet and outlet ports, a main valve between said inlet and outlet ports, a valve operating device including a single manually operable lever and a member pivotally mounted on said lever; said manually operated device being constructed and arranged upon the movement of said lever in one direction, to release said normally open valve and then to open said pilot valve, and pressure responsive means effective upon the presence of pressure in said valve body between said pilot valve and said outlet port to cooperate with said manually operated device to open said main valve.

2. In a valve for controlling the flow of liquefied gases, a valve body having an inlet port adapted to be connected with a source of supply, an outlet port provided with a device affording a means of connection with a receptable to be supplied, and manually operable valve means in said valve body comprising a pressure relieving port, a normally open valve operable to close said port, a normally closed pilot valve between said inlet and outlet ports, a main valve between said inlet and outlet ports, a manually operable lever, spring means normally operative to hold said lever at one extreme of movement, valve operating means disposed in said body and connected to said lever, and a pressure responsive device effective upon

the presence of pressure in said valve body between said pilot valve and said outlet port to cooperate with said valve operating means to open said pilot valve and said main valve and release said normally open valve for closing movement, said spring means upon release of said lever being effective to release said main valve, and then said pilot valve and finally to open said normally open valve.

3. In a valve for dispensing liquefied petroleum gases, the combination of a valve body having an inlet port adapted to be connected to a source of supply, an outlet port having means adapted to effect connection and disconnection with a receptacle to be supplied, a valve seat in said valve body adjacent said inlet port, a spring pressed valve member engageable with said valve seat, a valve seat in said valve member, a second spring pressed valve engageable with said last named valve seat, a fluid passage extending between said first named valve seat and said outlet port, a pressure relief port between said fluid passage and the exterior of said valve body, a valve seat in said pressure relief port, a third spring pressed valve engageable with said relief port valve seat and a combined fluid pressure response and manually operable means including a rock lever disposed in said fluid passage constructed and arranged to positively operate said valves in one direction and to release said valves for operation in the opposite direction by the springs associated therewith in a predetermined sequence.

4. In a valve for dispensing liquefied petroleum gases, the combination of a valve body having an inlet port adapted to be connected to a source of supply, an outlet port having means adapted to effect connection and disconnection with a receptacle to be supplied, a valve seat in said valve body adjacent said inlet port, a spring pressed valve member engageable with said valve seat, a valve seat in said valve member, a second spring pressed valve engageable with said last named valve seat, a fluid passage extending between said first named valve seat and said outlet port, a pressure relief port between said fluid passage and the exterior of said valve body, a valve seat in said pressure relief port, a third spring pressed valve engageable with said relief port valve seat, a rock shaft journalled in said valve body and intersecting said fluid passage, a rock lever fixed to said rock shaft and disposed in said fluid passage, an operating lever fixed to said rock shaft exteriorly of said valve body, an arm of said rock lever adapted to effect opening of said pressure relief valve, and other means associated with the other arm of said rock lever constructed and arranged to unseat said other valves in a predetermined sequence, said means including a pressure responsive device connected to said other arm of said rock lever effective upon the presence of pressure in said fluid passage to cooperate with said rock lever to open said first named valve.

5. In a valve for dispensing liquefied petroleum gases, the combination of a valve body having an inlet port adapted to be connected to a source of supply, an outlet port having means adapted to effect connection and disconnection with a receptacle to be supplied, a valve seat in said valve body adjacent said inlet port, a spring pressed valve member engageable with said valve seat, a valve seat in said valve member, a second spring pressed valve engageable with said last named valve seat, a fluid passage extending between said first named valve seat and said outlet port, a pressure relief port between said fluid passage and the exterior of said valve body, a valve seat in said pressure relief port, a third spring pressed valve engageable with said relief port valve seat, a rock shaft journalled in said valve body and intersecting said fluid passage, a rock lever fixed to said rock shaft and disposed in said fluid passage, an operating lever fixed to said rock shaft exteriorly of said valve body, an arm of said rock lever adapted to effect opening of said pressure relief valve, the other arm of the rock lever and means associated therewith constructed and arranged to unseat said other valves in a predetermined sequence, said means including a cylinder bore in said valve body and communication with said fluid passage, a piston in said cylinder, and a device interconnected with said piston and said second arm operable on manipulation of said rock lever and operation of said piston to open said first named valve.

6. In a valve for dispensing liquefied petroleum gases, the combination of a valve body having an inlet port adapted to be connected to a source of supply, an outlet port having means adapted to effect connection and disconnection with a receptacle to be supplied, a valve seat in said valve body adjacent said inlet port, a valve member engageable with said seat and having a hollow stem extending into said fluid passage, a pilot valve seat in said valve member, a pilot valve seated on said pilot valve seat and having a valve stem guided in and extending through said hollow stem into said fluid passage beyond the end of said hollow stem, a pressure relief valve port disposed adjacent said outlet port, a spring pressed valve in said pressure relief valve port, a rock shaft journalled in said valve body, a rock lever disposed in said fluid passage and connected to said rock shaft, means exteriorly of said body for oscillating said shaft, an arm of said rock lever adapted to engage and open said pressure relief valve, the second arm of said rock lever and means connected therewith adapted to engage and open said pilot valve and said first named valve in sequence; said means including a cylinder bore in said valve body communicating with said fluid passage, a piston in said cylinder, and a device interconnected with said piston and said rock lever means operable on manipulation of said rock lever and operation of said piston to open said first named valve.

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